Fetal growth restriction and causes

What fetal growth restriction means

Fetal growth restriction is generally used when a fetus has not achieved its expected growth potential. In clinical practice, suspicion often begins when estimated fetal weight or fetal abdominal circumference is below the 10th percentile for gestational age. However, percentiles are screening tools, not complete diagnoses. A fetus below the 10th percentile may be constitutionally small because of familial or ethnic growth patterns, while another fetus above that cutoff may still be growth restricted if growth has slowed substantially.

The related term "small for gestational age" describes size at a point in time, commonly below the 10th percentile. FGR implies a pathologic restriction of growth potential. Clinicians therefore interpret fetal size together with interval growth, Doppler studies, amniotic fluid volume, maternal disease, fetal anatomy, genetic considerations, and overall pregnancy history.

FGR is sometimes divided into early-onset and late-onset disease. Early-onset FGR, often recognized before 32 weeks, is more commonly associated with significant placental dysfunction, hypertensive disease, abnormal Doppler findings, and fetal or genetic conditions. Late-onset FGR is more common and may be subtler, sometimes appearing near term with less dramatic ultrasound

abnormalities but still requiring careful attention.

Placental insufficiency: the central mechanism

The placenta is the interface through which oxygen, glucose, amino acids, fatty acids, micronutrients, and waste products move between the pregnant person and the fetus. When placental development or function is impaired, the fetus may receive inadequate oxygen and nutrition. This is often called placental insufficiency, and it is one of the most important mechanisms behind FGR.

Placental insufficiency can arise from abnormal placental implantation, impaired remodeling of uterine blood vessels, placental infarction, thrombosis, inflammation, or vascular malperfusion. These processes may reduce blood flow across the maternal-fetal circulation. In response, the fetus may redistribute blood flow toward essential organs such as the brain, a compensatory pattern sometimes assessed with Doppler ultrasound.

Placental causes of FGR may occur alone or alongside maternal conditions. They are commonly linked with hypertensive disorders of pregnancy, especially preeclampsia, because both conditions can reflect abnormal placental vascular function. When placental insufficiency is significant, it may also be associated with low amniotic fluid, abnormal umbilical artery Dopplers, reduced fetal movement, or the need to consider earlier delivery.

Maternal causes and risk factors

Several maternal health factors can reduce uteroplacental blood flow, alter nutrient supply, increase inflammation, or affect fetal oxygenation. Having one risk factor does not mean FGR will occur, and many pregnancies with risk factors have healthy growth. Still, these factors often guide screening and surveillance.

Hypertensive disorders: Chronic hypertension and preeclampsia are strongly associated with placental dysfunction and FGR.
Diabetes and vascular disease: While diabetes is often associated with larger fetal size, diabetes with vascular complications can increase the risk of impaired placental perfusion and growth restriction.
Kidney, cardiac, pulmonary, or autoimmune disease: Conditions affecting oxygen

delivery, blood flow, or inflammation can influence fetal growth.
Malnutrition or significant food insecurity: Inadequate maternal nutrient intake can contribute, particularly when severe or combined with illness.
Substance exposure: Tobacco, alcohol, cocaine, and some other drugs are associated with poor fetal growth through vascular, toxic, and oxygen-delivery effects.
Multiple pregnancy: Twins and higher-order multiples have greater risks of growth restriction, especially when placental sharing or complications are present.
Extremes of maternal age or prior obstetric history: Previous FGR, stillbirth, placental abruption, or severe preeclampsia may increase recurrence risk.

Maternal contributors should be approached without shame. Smoking, alcohol, substance use, nutrition challenges, and chronic illness often intersect with stress, access to care, mental health, and social circumstances. Supportive care focuses on harm reduction, medical treatment, and practical resources rather than blame.

Fetal, genetic, and structural causes

Some cases of FGR originate primarily from the fetus. Chromosomal abnormalities, single-gene disorders, congenital infections, metabolic conditions, or major structural anomalies can alter cellular growth, organ development, and fetal energy use. In these cases, growth restriction may be symmetric, meaning the head, abdomen, and long bones are all small, although patterns vary.

Structural anomalies involving the heart, kidneys, central nervous system, skeleton, or gastrointestinal tract may coexist with reduced growth. When ultrasound suggests FGR together with an anatomic abnormality, clinicians may discuss targeted imaging, fetal echocardiography, genetic counseling, diagnostic testing, or referral to maternal-fetal medicine. These decisions are personal and depend on gestational age, findings, values, and local resources.

Genetic causes are not always visible on a standard ultrasound, and a normal genetic test does not exclude every possible condition. Conversely, many fetuses with isolated small size and reassuring monitoring do not have a genetic disorder. The aim is to identify situations where additional

information would meaningfully change counseling, delivery planning, or newborn care.

Infections and inflammatory causes

Infections can impair fetal growth through placental inflammation, direct fetal infection, anemia, organ injury, or disruption of nutrient transfer. Classic congenital infection considerations include toxoplasmosis, rubella, cytomegalovirus, herpes, syphilis, varicella, and others, though the most relevant testing depends on exposure history, ultrasound findings, vaccination status, and local epidemiology.

Cytomegalovirus is a commonly discussed infectious cause of fetal growth restriction, particularly when ultrasound also shows findings such as intracranial calcifications, ventriculomegaly, echogenic bowel, hepatosplenomegaly, or abnormal amniotic fluid. Rubella and toxoplasmosis can also be associated with growth restriction and congenital abnormalities. Syphilis remains important because screening and treatment can reduce serious pregnancy and newborn complications.

Not every infection-like illness causes FGR, and broad testing without clinical context can lead to confusing results. If infection is suspected, healthcare professionals may recommend targeted maternal blood tests, amniotic fluid testing in selected cases, serial ultrasound, or neonatal evaluation after birth.

Umbilical cord and amniotic fluid factors

The umbilical cord carries fetal blood to and from the placenta. Cord abnormalities can sometimes contribute to impaired fetal growth, especially if they affect blood flow or are associated with placental abnormalities. Examples include velamentous cord insertion, marginal cord insertion, single umbilical artery, true knots, cord compression, or abnormalities in cord coiling, though the significance varies widely.

Amniotic fluid volume is another important clue. Low amniotic fluid, or oligohydramnios, may accompany placental insufficiency because reduced fetal blood flow to the kidneys can lower urine production, which is a major source

of amniotic fluid later in pregnancy. Abnormal fluid does not by itself identify the cause, but it can influence monitoring and delivery planning.

Ultrasound assessment of placental location, cord insertion when visible, amniotic fluid, and Doppler flow helps clinicians place fetal size into context. A single measurement is rarely enough; trends and the broader pattern matter.

How suspected FGR is evaluated

Evaluation usually begins with confirming pregnancy dating, because incorrect gestational age can make a normally grown fetus appear small. First-trimester ultrasound dating is generally more accurate than later dating. Clinicians also review parental body size, prior infant weights, medical conditions, medications, blood pressure, laboratory results, substance exposures, infection risks, and fetal anatomy.

Ultrasound is central. Estimated fetal weight is calculated from biometric measurements such as head circumference, abdominal circumference, and femur length. Abdominal circumference is particularly informative because it reflects liver size and glycogen storage, both sensitive to nutrient supply. Serial growth scans are usually spaced over time because fetal growth cannot be reliably judged from measurements repeated too soon.

Doppler ultrasound evaluates blood-flow patterns, commonly in the umbilical artery and sometimes the middle cerebral artery or ductus venosus, depending on gestational age and severity. Nonstress testing, biophysical profile, maternal blood pressure monitoring, and laboratory tests may also be used. The purpose is to identify whether the fetus is stable in the uterus or whether delivery would be safer.

Management principles and emotional support

There is usually no single medication or diet that reverses established FGR. Management focuses on identifying treatable contributors, optimizing maternal health, reducing harmful exposures, monitoring fetal well-being, and choosing the safest timing and mode of delivery. For example, clinicians may manage hypertension, review diabetes control, address smoking or substance exposure,

treat certain infections, or coordinate care for chronic disease.

Delivery timing is individualized. If FGR is mild and testing remains reassuring near term, pregnancy may continue with close surveillance. If Dopplers are severely abnormal, fetal testing becomes nonreassuring, preeclampsia develops, or maternal health is at risk, earlier delivery may be recommended. In preterm situations, clinicians may discuss antenatal corticosteroids for fetal lung maturity, magnesium sulfate for neuroprotection at certain gestational ages, neonatal intensive care consultation, and the risks of prematurity.

The emotional burden of FGR can be substantial. Many parents feel fear between scans, guilt about possible causes, or distress over uncertain information. It is appropriate to ask your care team what findings are reassuring, what would change the plan, how often monitoring is needed, and when to seek urgent care. Support from a partner, family, doula, counselor, social worker, or patient navigator can be just as important as the medical plan.